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TITLE: TELEMATIC RETRIEVAL OF VEHICLE PERFORMANCE INFORMATION

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TELEMATIC RETRIEVAL OF VEHICLE PERFORMANCE INFORMATION

FIELD OF THE INVENTION

The invention relates to vehicles, and more particularly to methods and systems for obtaining vehicle system performance information through a wireless communication network.

BACKGROUND OF THE INVENTION

Presently, many passenger vehicles, buses, trucks, and the like, incorporate complex component vehicle systems. The application of very large scale integration components (VLSI) for processing and control functions permits the use of discrete computer controlled sub-systems within a vehicle to control many vital vehicle functions. Generally, each type of vehicle system control module incorporates application-specific software that executes various system functions and also operating parameters for the vehicle system. Furthermore, many vehicles incorporate a vehicle system communication network that permits bi-directional communication between the component systems of such a vehicle. One example of a computer controlled vehicle system is a power-train control module (PCM). The power-train control module for a vehicle typically controls combustion, engine timing and fuel mixture among other functions. Vehicle emissions are therefore controllable via a power train control module, often through the application of one or more engine emission sensors that monitor several parameters of engine combustion and exhaust. Such engine emission data is valuable. When accurately collected, emission data describes the operating condition of a vehicle engine and can, therefore, indicate needed repairs or the onset of wear among other things. Furthermore, emission data is useful for statistical analysis across large sample groups for manufacturers and monitoring agencies.

Many passenger vehicles now incorporate an integrated communication system. A Vehicle Communication Unit (VCU) used in conjunction with a Wide Area Network (WAN) such as a cellular telephone network or a satellite communication system allows for a variety of fee-based subscription services to be provided in a mobile environment. The VCU is typically a vehicle telematics device including a cellular radio, satellite transceiver and/or global positioning capabilities. Communication through a carrier service may be initiated at the VCU at turn-on or through manual or voice command phone number entry. Typically, a radio communication link is established between the VCU and a Wide Area Network (WAN), using a node of the WAN in the vicinity of the VCU.

In addition to enabling telecommunication services, a VCU may be configured to perform various processing functions and to exchange various types of data with a service provider such as service codes and error codes, for example.

It would be desirable therefore, to provide a method and system for providing vehicle emission performance information through a wireless communication network that leverages the above-described capabilities.

SUMMARY OF THE INVENTION

The present invention is directed to a method for configurable dynamic telematic retrieval of vehicle system performance information, the method including receiving vehicle performance data at a telematics device from at least one vehicle system, processing the received vehicle performance data at the telematics device, producing vehicle system performance information based on the processed vehicle performance data, and communicating the vehicle system performance information to a service provider.

In accordance with yet another aspect of the invention a computer readable medium includes computer readable code for directing a reception of vehicle performance data at a telematics device from at least one vehicle system, computer readable code for processing the received vehicle performance data at the telematics device, computer readable code for producing vehicle system performance information based on the processed vehicle performance data, and computer readable code for directing a communication of the vehicle system performance information to a service provider.

In accordance with still another aspect of the invention, a system for configurable dynamic telematic retrieval of vehicle system performance information includes means for receiving vehicle performance data at a telematics device from at least one vehicle system, means for processing the received vehicle performance data at the telematics device, means for producing vehicle system performance information based on the processed vehicle performance data, and means for communicating the vehicle system performance information to a service provider.

The foregoing and other features and advantages of the invention will become further apparent from the following detailed description of the presently preferred embodiment, read in conjunction with the accompanying drawings. The detailed description and drawings are merely illustrative of the invention rather than limiting, the scope of the invention being defined by the appended claims and equivalents thereof.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG.1 is an illustrative operating environment for configurable dynamic telematic retrieval of vehicle system performance information in an embodiment of the present invention.

FIG. 2 is a block diagram of a system for configurable dynamic telematic retrieval of vehicle system performance information in accordance with an embodiment of the present invention.

FIG. 3 is a process flow diagram of a method for configurable dynamic telematic retrieval of vehicle system performance information.

DETAILED DESCRIPTION OF THE PRESENTLY PREFERRED EMBODIMENT

FIG.1 is an illustrative operating environment for configurable dynamic telematic retrieval of vehicle system performance information in an embodiment of the present invention. FIG. 1 shows a mobile vehicle communication system **100**. Mobile vehicle communication system **100** includes at least one mobile vehicle **110** (vehicle) including vehicle communication network **112** and vehicle communications unit (VCU) **120**, one or more wireless carrier systems **140**, one or more communication networks **142**, one or more land networks **144**, one or more client, personal or user computers **150**, one or more web-hosting portals **160**, and one or more call centers **170**. In one embodiment, mobile vehicle **110** is implemented as a vehicle equipped with suitable hardware and software for transmitting and receiving voice and data communications. VCU **120** is also called a telematics unit or device.

In one embodiment, VCU **120** includes a digital signal processor (DSP) **122** connected to a wireless modem **124**, a global positioning system (GPS) unit **126**, an in-vehicle memory **128** such as, for example, a non-volatile flash memory, a microphone **130**, one or more speakers **132**, and an embedded or in-vehicle mobile phone **134**. In one embodiment, DSP **122** is a microcontroller, controller, host processor, or vehicle communications processor. In an example, DSP **122** is implemented as an application specific integrated circuit (ASIC). GPS unit **126** provides longitude and latitude coordinates of the vehicle, as well as a time and date stamp. In-vehicle mobile telephone system **134** is a cellular-type phone such as, for example an analog, digital, dual-mode, dual-band, multi-mode, or multi-band cellular phone. In another example, the mobile telephone system is an analog mobile telephone system operating over a prescribed band nominally at 800 MHz. In another example, the mobile telephone system is a digital mobile telephone system operating over a prescribed band nominally at 800 MHz, 900 MHz, 1900 MHz, or any suitable band capable of carrying digital cellular communications.

DSP **122** executes various computer programs and communication control and protocol algorithms that affect communication, programming and operational modes of electronic and mechanical systems within vehicle **110**. In one embodiment, DSP **122** is an embedded system controller. In another embodiment, DSP **122** controls communications between telematics device **120**, wireless carrier system **140**, and call center **170**. In yet another embodiment, DSP **122** controls communications between the wireless modem **124** and nodes of a mobile ad hoc network. In still another embodiment, DSP **122** provides processing, analysis, and control functions for determining engine emission performance for vehicle **110**. DSP **122** is configured to generate and receive digital signals transmitted between telematics device **120** and a vehicle communication network **112** that is connected to various electronic modules in the vehicle **110**. In one embodiment, the digital signals activate a programming

mode and operation modes, as well as provide for data transfers. In another embodiment, a utility program facilitates the transfer of emission data, emission analysis data, instructions, triggers and data requests between vehicle **110** and a call center **170**.

Mobile vehicle **110**, via a vehicle communication network **112**, sends signals to various units of equipment and systems within vehicle **110** to perform various functions such as monitoring the operational state of vehicle systems; collecting and storing data from the vehicle systems; providing instructions, data and programs to various vehicle systems; and calling from telematics device **120**. In facilitating interactions among the various communication and electronic modules, vehicle communication network **112** utilizes bus interfaces such as controller-area network (CAN), International Organization for Standardization (ISO) Standard 9141, ISO Standard 11898 for high-speed applications, ISO Standard 11519 for lower speed applications, and Society of Automotive Engineers (SAE) standard J1850 for higher and lower speed applications. In one embodiment, vehicle communication network **112** is a direct connection between connected devices.

Vehicle **110**, via telematics device **120**, sends to and receives radio transmissions from wireless carrier system **140**. Wireless carrier system **140** is implemented as any suitable system for transmitting a signal from mobile vehicle **110** to communication network **142**. Wireless carrier system **140** incorporates any type of telecommunications in which electromagnetic waves carry signal over part of or the entire communication path. In one embodiment, wireless carrier system **140** transmits analog audio and/or video signals. In an example, wireless carrier system **140** transmits analog audio and/or video signals such as those sent from AM and FM radio stations and transmitters, or digital audio signals in the S band (approved for use in the U.S.) and L band (used in Europe and Canada). In one embodiment, wireless carrier system **140** is a satellite

broadcast system broadcasting over a spectrum in the S band (2.3 GHz) that has been allocated by the U.S. Federal Communications Commission (FCC) for nationwide broadcasting of satellite-based Digital Audio Radio Service (DARS).

Communication network **142** includes services from one or more mobile telephone switching offices and wireless networks. Communication network **142** connects wireless carrier system **140** to land network **144**. Communication network **142** is implemented as any suitable system or collection of systems for connecting wireless carrier system **140** to mobile vehicle **110** and land network **144**. In one example, wireless carrier system **140** includes a short message service, modeled after established protocols such as IS-637 SMS standards, IS-136 air interface standards for SMS, and GSM 03.40 and 09.02 standards. Similar to paging, an SMS communication could be broadcast to a number of regional recipients. In another example, the carrier system **140** uses services in accordance with other standards such as, for example, IEEE 802.11 compliant wireless systems and Bluetooth compliant wireless systems.

Land network **144** is a public-switched telephone network (PSTN). In one embodiment, land network **144** is implemented as an Internet protocol (IP) network. In other embodiments, land network **144** is implemented as a wired network, an optical network, a fiber network, another wireless network, a virtual private network (VPN) or any combination thereof. Land network **144** is connected to one or more landline telephones. Land network **144** connects communication network **142** to user computer **150**, web-hosting portal **160**, and call center **170**. Communication network **142** and land network **144** connect wireless carrier system **140** to web-hosting portal **160** and call center **170**.

Client, personal, or user computer **150** includes a computer usable medium to execute Internet browser and Internet-access computer programs for sending and receiving data over land network **144** and, optionally, wired or wireless communication networks **142** to web-hosting portal **160** and vehicle **110**. Personal or user computer **150** sends data to web-hosting portal **160** through a web-page interface using communication standards such as hypertext transport protocol (HTTP) and transport-control protocol Internet protocol (TCP/IP). In one embodiment, the data includes directives to change certain programming and operational modes of electronic and mechanical systems within vehicle **110**. In another embodiment, the data includes requests for certain data such as vehicle system performance information. In operation, a user such as, for example, a vehicle designer or manufacturing engineer, utilizes user computer **150** to exchange information with mobile vehicle **110** that is cached or stored in web-hosting portal **160**. In an embodiment, vehicle system performance information from client-side software is transmitted to server-side software of web-hosting portal **160**. In one embodiment, vehicle system performance information is stored at web-hosting portal **160**. In another embodiment, client computer **150** includes a database (not shown) for storing received vehicle system performance data. In yet another embodiment, a private Local Area Network (LAN) is implemented for client computer **150** and web-hosting portal **160**, such that the web-hosting portal is operated as a Virtual Private Network (VPN).

Web-hosting portal **160** includes one or more data modems **162**, one or more web servers **164**, one or more databases **166**, and a network **168**. Web-hosting portal **160** is connected directly by wire to call center **170**, or connected by phone lines to land network **144**, which is connected to call center **170**. Web-hosting portal **160** is connected to land network **144** by one or more data modems **162**. Land network **144** transmits digital data to and from modem **162**; data that is subsequently transferred to web server **164**. In one implementation, modem **162** resides inside web server **164**. Land network **144** transmits data communications between web-hosting portal **160** and call center **170**.

Web server **164** receives various data, requests or instructions from user computer **150** via land network **144**. In alternative embodiments, user computer **150** includes a wireless modem to send data to web-hosting portal **160** through a wireless communication network **142** and a land network **144**. Data is received by modem **162** and sent to one or more web servers **164**. In one embodiment, web server **164** is implemented as any suitable hardware and software capable of providing web services to transmit and receive data from user computer **150** to telematics device **120** in vehicle **110**. Web server **164** sends to or receives data transmissions from one or more databases **166** via network **168**. In an embodiment, web server **164** includes computer applications and files for managing emission performance data.

In one embodiment, one or more web servers **164** are networked via network **168** to distribute vehicle engine emission performance data among its network components such as database **166**. In an example, database **166** is a part of or a separate computer from web server **164**. In one embodiment, web server **164** sends data transmissions including vehicle system performance information to call center **170** via modem **162** and through land network **144**.

Call center **170** is a location where many calls are received and serviced at the same time, or where many calls are sent at the same time. In one embodiment, the call center is a telematics call center, facilitating communications to and from telematics device **120** in vehicle **110**. In an example, the call center is a voice call center, providing verbal communications between an advisor in the call center and a subscriber in a mobile vehicle. In another example, the call center contains each of these functions. In other embodiments, call center **170** and web-hosting portal **160** are located in the same or different facilities.

Call center **170** contains one or more voice and data switches **172**, one or more communication services managers **174**, one or more communication services databases **176**, one or more communication services advisors **178**, and one or more networks **180**.

Switch **172** of call center **170** connects to land network **144**. Switch **172** transmits voice or data transmissions from call center **170**, and receives voice or data transmissions from telematics device **120** in mobile vehicle **110** through wireless carrier system **140** and/or wireless modem **124**, communication network **142**, and land network **144**. Switch **172** receives data transmissions from and sends data transmissions to one or more web-hosting portals **160**. Switch **172** receives data transmissions from or sends data transmissions to one or more communication services managers **174** via one or more networks **180**.

Communication services manager **174** is any suitable hardware and software capable of providing communication services to telematics device **120** in mobile vehicle **110**. Communication services manager **174** sends to or receives data transmissions from one or more communication services databases **176** via network **180**. Communication services manager **174** sends to or receives data transmissions from one or more communication services advisors **178** via network **180**. Communication services database **176** sends to or receives data transmissions from communication services advisor **178** via network **180**. Communication services advisor **178** receives from or sends to switch **172** voice or data transmissions.

Communication services manager **174** facilitates one or more services such as, but not limited to, enrollment services, navigation assistance, directory assistance, roadside assistance, business or residential assistance, information services assistance, emergency assistance, communications assistance, and telematics retrieval of vehicle system performance information. In an embodiment, communication services manager **174** receives service requests for a vehicle emission performance data update from a user via user computer **150**, web-hosting portal **160**, and land network **144**. Communication services manager **174** transmits and receives operational status, instructions and other types of vehicle data to telematics device **120** in mobile vehicle **110** through wireless carrier system **140**, communication network **142**, land network **144**,

wireless modem **124**, voice and data switch **172**, and network **180**. Communication services manager **174** stores or retrieves vehicle system performance information from communication services database **176**. Communication services manager **174** provides requested information to communication services advisor **178**.

In one embodiment, communication services advisor **178** is a real advisor. In another embodiment, communication services advisor **178** is implemented as a virtual advisor. In an example, a real advisor is a human being at a service provider service center in verbal communication with a service subscriber in mobile vehicle **110** via telematics device **120**. In another example, a virtual advisor is implemented as a synthesized voice interface responding to requests from telematics device **120** in mobile vehicle **110**. In another embodiment, communication services advisor **178** is embodied in software executing on a computing system that provides automated configurable dynamic telematic retrieval of vehicle system performance information.

Communication services advisor **178** provides services to telematics device **120** in mobile vehicle **110**. Services provided by communication services advisor **178** include enrollment services, navigation assistance, real-time traffic advisories, directory assistance, roadside assistance, business or residential assistance, information services assistance, emergency assistance, and communications assistance. Communication services advisor **178** communicates with telematics device **120** in mobile vehicle **110** through wireless carrier system **140**, communication network **142**, and land network **144** using voice transmissions, or through communication services manager **174** and switch **172** using data transmissions. Switch **172** selects between voice transmissions and data transmissions.

Mobile vehicle **110** initiates service requests to call center **170** by sending a voice or digital-signal command to telematics device **120** which, in turn, sends an instructional signal or a voice call through wireless modem **124**, wireless carrier system **140**, communication network **142**, and land network **144** to call center **170**. In another embodiment, the service request is for a vehicle system performance information upload that initiates a vehicle system performance information transfer between vehicle **110** and service center **170** or web-hosting portal **160**. In another embodiment, mobile vehicle **110** receives a request from call center **170** to send various types of vehicle system performance information from mobile vehicle **110** through telematics device **120** through wireless modem **124**, wireless carrier system **140**, communication network **142**, and land network **144** to call center **170**. In one embodiment, one or more triggers stored in the telematics device **120** cause the vehicle to initiate a service request. The trigger is, for example, a number of ignition cycles, a specific time and date, an expired time, a number of kilometers, an absolute Global Positioning System (GPS) timestamp, a request vehicle emission performance data, and the like.

FIG. 2 is a block diagram of a system for configurable dynamic telematic retrieval of vehicle system performance information in accordance with an embodiment of the present invention. FIG. 2 shows a telematics-based vehicle system performance information retrieval system **200** (retrieval system). In one embodiment, the components of retrieval system **200** are operational within an illustrative operating environment according to FIG. 1.

In FIG. 2, retrieval system **200** includes a telematics service center **270**, and a mobile vehicle **210** having a telematics device **220** that is coupled to one or more vehicle system modules **290** via a communication network **212**. The telematics device **220** is shown including a database **228** that contains programs **231**, vehicle system performance data **232**, and event triggers **234**. The vehicle system module **290** is shown including a program **291** and vehicle system performance data **292**. The service center **270** is shown including a database **276** containing vehicle system performance information **273**, programs **271**, and event triggers **274**. The telematics service center is shown in communication with the telematics device **220** in vehicle **210**. In one embodiment, communication network **212** coupling telematics device **220** to vehicle system modules **290** is a direct connection between the connected devices. In another embodiment, communication network **212** is a vehicle communication network **112** as described in FIG. 1. In one embodiment, vehicle system performance data **232** comprises vehicle system performance information.

Mobile vehicle **210** is any type of vehicle including a passenger vehicle, bus, truck, and the like that includes integrated vehicle system modules **290** such as engine emission sensors and a telematics device. In one embodiment, vehicle **210** and various systems of vehicle **210** are uniquely identifiable via an assigned identification code such as, for example, a vehicle identification number (VIN) or a device identification code of a vehicle system module **290** or telematics device **220**.

Telematics device **220** is any telematics device enabled for operation with a telematics service provider such as telematics device **120** as described with reference to FIG. 1. In one embodiment, telematics device **220** is coupled to communication network **212** for communicating data between vehicle system modules **290** and the telematics device **220**. Telematics device **220** includes volatile and non-volatile memory components for storing data and programs. In one embodiment, memory components in telematics device **220** contain database **228**. In an embodiment, database **228** includes one or more programs **231** for performing and managing vehicle system performance analysis processes and data transfers such as, for example, an emission data analysis module, and other programs **231** for detecting vehicle system performance update triggers, emission analysis data requests, and the like. In one embodiment, an emission analysis program module performs various analytic processes on vehicle performance data received from a vehicle performance measurement system to render vehicle performance data.

In an embodiment, analytic processes performed by telematics device **220** include analyzing combustion efficiency and by-products, sulphurous compound content, and the like. In another embodiment, an emission data upload module manages performance information **232** such as analyzed emission data, engine emission data, triggers **234**, and dynamic configuration data commands and programs **231**. In still another embodiment, the telematics device **220** acts as a data cache for performance information **232** such as, for example, emission data, caching any data received from a vehicle system module **290** such as an engine emission sensor.

Vehicle system module **290** (VSM) is any vehicle system control module having software or hardware or both components for operating, controlling, or monitoring one or more vehicle system parameters. In one embodiment, vehicle system module **290** is a vehicle system controller such as, for example, a power train control module (PCM). Other embodiments feature controllers that affect other vehicle systems, including the chassis, body, and information and entertainment systems. In another embodiment, VSM **290** contains one or more processors, one or more memory devices, one or more sensors such as for example, emissions sensors, and one or more connection ports for communicating vehicle system data to and from the VSM **290**. In an embodiment, VSM **290** is coupled to a vehicle communication network **212** and, therefore, to any other device that is also coupled to vehicle communication network **212**. In another embodiment, VSM **290** is connected directly to telematics device **220**.

In an embodiment, VSM **290** includes one or more programs **291** and vehicle system performance data **292** stored in memory. In one embodiment, program **291** includes computer code instructions for managing emission data monitoring processes. In another embodiment, program **291** includes computer code instructions for managing chassis data monitoring processes. In another embodiment, program **291** includes computer code instructions for managing body data monitoring processes. In another embodiment, program **291** includes computer code instructions for managing information and entertainment system data monitoring processes. In still another embodiment, VSM **290** is configured as an engine emission sensor that senses parameters and provides a digital or analog output data signal proportional to a measured parameter. In still another embodiment, VSM **290** is a vehicle emission sensor such as, for example, an oxygen sensor, a carbon monoxide sensor, a carbon dioxide sensor, a temperature sensor, a pressure or pressure gradient sensor, and the like. In an embodiment, VSM **290** is a passive engine emission sensor that outputs an

emission measurement system data signal. In another embodiment, VSM **290** is an active engine emission sensor that outputs an emission data signal. In other embodiments, VSM **290** controls or monitors a vehicle system such as a powertrain, a chassis, a body, or an information or entertainment subsystem. For each VSM **290**, one or more system performance parameters are measured to generate vehicle system performance data **292**, including, but not limited to, system operational parameters, real-time measurements, operator settings, and the like.

Telematics service center **270** is any service center providing telematics services such as call center **170** described with reference to FIG. 1. In one embodiment, service center **270** includes hardware and software for managing a database **276** having vehicle system performance information **273**. In another embodiment, service center **270** is configured to access a database that is in another location but coupled to service center **270** such as, for example, database **166** in web server **160** as described in FIG. 1. In an embodiment, database **276** contains records of vehicle system performance information **273**. Vehicle system performance information **273** includes raw data such as vehicle system performance data retrieved from vehicle **210** and processed data such as analyzed vehicle system performance data retrieved from vehicle **210**. In another embodiment, database **276** includes one or more programs for managing emission analysis data. In yet another embodiment, database **276** is a relational database that includes vehicle data and triggers **274** such as, for example, vehicle makes and models, individual vehicle identification numbers (VIN) and other vehicle identifiers, and vehicle performance analysis configuration data corresponding to specific vehicles of the database. In an embodiment, triggers **271** and performance analysis configuration data or instructions are communicated from service center **270** to telematics unit **220** during a telematics enabled communication session between service center **270** and telematics unit **220**. Configuration data includes instructions and data to

reconfigure the telematics unit for vehicle system performance analysis operations such as specific data processing sequences when performance data are received from a vehicle system module **290**. Other forms of configuration data include time intervals to report emission analysis data, or absolute GPS timestamps, and the like.

In operation, service center **270** manages the retrieval and compilation of vehicle system performance information through a telematics service provider network such as the operating environment described in FIG. 1. In an embodiment, service center **270** is enabled to concatenate, and otherwise manage, vehicle system performance information for a plurality of vehicles **210**. In operation, service center **270** receives vehicle system performance information from vehicle **210** and stores the vehicle system performance information in database **276**. A trigger such as, for example, the expiration of a periodic time interval or an absolute GPS timestamp initiates a communication from vehicle **210** to service center **270**. In an embodiment, a request for vehicle system performance information is provided from the service center **270** to the telematics device **220** of mobile vehicle **210**.

FIG. 3 is a process flow diagram of a method for telematic retrieval of vehicle emission performance information. In one embodiment, method **300** is implemented with components of the exemplary systems described with reference to FIGS 1 and 2. In another embodiment, one or more steps of method **300** are embodied in a computer readable medium containing computer readable code. Method **300** begins in step **310**. In step **310**, vehicle performance data is received from at least one vehicle system. In one embodiment, the vehicle performance data is received at a telematics device at any time that a mobile vehicle **210** is operational. In an embodiment, the received vehicle performance data is the output of a vehicle system module **290**. In another embodiment, the received vehicle performance data is the output of an engine emission sensor. In one embodiment, the received vehicle performance data is received in an onboard DSP **122**.

In step **320**, the vehicle performance data is processed. The vehicle performance data is processed at any time after the vehicle performance data is received. In one embodiment, the vehicle performance data is processed by DSP **122**.

In an embodiment, processing the received vehicle performance data includes evaluating the received vehicle system performance data and storing the evaluated vehicle system performance data. In another embodiment, evaluating the received vehicle performance data includes comparing the received vehicle system performance data from each vehicle system to an expected vehicle system performance data range, flagging the vehicle system performance data as valid when the vehicle system performance data is within an expected vehicle system performance range, and flagging the data as invalid when the vehicle system performance data is not within an expected vehicle system performance range. In one embodiment, an emission sensor provides vehicle performance data. An emission sensor generally has expected ranges of output values. Data output from an emission sensor that exceeds the nominal expected sensor operating ranges indicates a sensor error, system malfunction, or an engine condition requiring attention. In another embodiment, processing the vehicle performance data includes caching the vehicle performance data. In still another embodiment, processing the vehicle performance data includes storing the vehicle performance data to volatile or non-volatile memory or a database.

In step **330**, vehicle system performance information is produced based on the processed vehicle performance data. The vehicle system performance information is produced at any time after the vehicle performance data is processed. In one embodiment, producing the performance information includes retrieving the evaluated vehicle system performance data, analyzing the evaluated vehicle system performance data and storing the analyzed vehicle

system performance data as vehicle system performance information. In one embodiment, the vehicle system performance information is produced by DSP **122**.

In step **340**, the vehicle system performance information is communicated to a service provider. The vehicle system performance information is communicated at any time after the vehicle system performance information is produced. In an embodiment, communicating the vehicle system performance information includes detecting a vehicle system performance information upload trigger and initiating at least one communication session with the service provider responsive to detecting the vehicle system performance information upload trigger. In one embodiment, the vehicle system performance information is sent from DSP **122** to telematics unit **120** and then communicated to the call center **170**.

An embodiment includes receiving at least one vehicle system performance information request from the service provider and sending vehicle system performance information to the service provider responsive to the request. Another embodiment includes receiving updated vehicle system performance information upload triggers from the service provider and storing the updated vehicle system performance information upload triggers at the telematics device. In such an embodiment, a service center requests vehicle system performance information from call center **170**, call center **170** requests the vehicle system performance information from the telematics unit **120,** telematics unit **120** requests the vehicle system performance information from DSP **122**, and the information is then passed back up the chain of requestors.

Yet another embodiment includes transmitting vehicle system performance information to the service provider responsive to initiating the at least one communication session. Thus, after the call center **170** receives the vehicle system performance information, the call center **170** transmits the vehicle system performance information to a service provider. In an embodiment, performance information is engine emission data, emission analysis data, evaluated engine emission data, event triggers, and dynamic configuration data.

Still another embodiment includes receiving a vehicle system performance analysis configuration from a service provider, storing the vehicle system performance analysis configuration at the telematics unit, where the vehicle performance information is produced at the telematics unit based on the stored vehicle system performance analysis configuration.

In the above manner, vehicle performance data from one or more vehicle systems is received at a telematics device for processing and production of vehicle performance information. Valid vehicle performance data is stored at a telematics unit and then analyzed. The analyzed performance data is periodically delivered through a communication session from the telematics unit to a service provider based on triggering events, with the analyzed data then stored to a database at the service provider. During a communication session, the service provider requests specific vehicle performance information and provides telematics device configuration instructions and triggers.

It is anticipated that the invention will be embodied in other specific forms not described that do not depart from its spirit or essential characteristics. The described embodiments are to be considered in all respects only as illustrative and not restrictive.